

Diversion (feet)

Definition

A channel constructed across the slope with a supporting ridge on the lower side.

Scope

This standard applies to the installation of all diversions except floodwater diversions (400) and diversion dams (348).

Purpose

To divert excess water from one area for use or safe disposal in other areas.

Conditions where practice applies

This practice applies to sites where:

1. Runoff damages cropland, pastureland, farmsteads, feedlots, or conservation practices such as terraces or stripcropping.
2. Surface flow and shallow subsurface flow caused by seepage are damaging sloping upland.
3. Runoff is in excess and available for use on near-by sites.
4. A diversion is required as part of a pollution abatement system.
5. A diversion is required to control erosion and runoff on urban or developing areas and construction or mining sites.

Planning considerations

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
2. The type of outlet, time of water detention, geology, and topography of the site.

Water Quality

1. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff.

2. Effects of nutrients and pesticides on surface and ground water quality.
3. Filtering effects of vegetation on movement of sediment and dissolved and sediment-attached substances.
4. Short-term and construction-related effects on the quality of downstream water.
5. Effects on the movement of dissolved substances below the root zone and toward the ground water.
6. Potential for uncovering or redistributing toxic materials and low productive soils that might cause undesirable effects on the water or plants.

Design criteria

Capacity. Diversions as temporary measures, with a life span of less than 2 years, shall carry as a minimum the 2-year, 24-hour-duration storm. Diversions that protect agricultural land and those that are part of a pollution abatement system must have the capacity to carry the peak runoff from a 10-year-frequency, 24-hour-duration storm as a minimum.

Diversions designed to protect areas such as urban areas, buildings, and roads, shall have enough capacity to carry the peak runoff expected from a storm frequency consistent with the hazard involved but not less than a 25-year-frequency, 24-hour-duration storm with a freeboard not less than 0.3 ft.

Cross section. The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes. The ridge height shall include an adequate settlement factor. The ridge shall have a minimum top width of 4 ft at the design elevation. The minimum cross section shall meet the specified dimensions. The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement.

Grade and velocity. Channel grades may be uniform or variable. Channel velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Location. The location of the diversion shall be determined by outlet conditions, topography, land use, cultural operations, and soil type. A diversion in a cultivated field must be aligned to permit use of modern farming equipment.

Protection against sedimentation. Diversions should not be used below high-sediment-producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions. If movement of sediment into the channel is a significant problem, a vegetated filter strip shall be used where soil or climate does not preclude its use. Then, the design shall include extra capacity for sediment and be supported by supplemental structures, cultural or tillage practices, or special maintenance measures.

Outlets. Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, a stable watercourse, or a combination of these practices. The outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed before diversion construction to insure establishment of vegetative cover in the outlet channel. Underground outlets consist of an inlet and underground conduit. The release rate when combined with storage is to be such that the design storm will not overtop the diversion ridge. On large watersheds, runoff flows are usually too large to outlet entirely through underground outlets.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Vegetation. Disturbed areas that are not to be cultivated shall be established to grass as soon as practicable after construction. If the soils or climatic conditions preclude the use of vegetation for erosion protection, nonvegetative linings such as gravel, rock riprap, or cellular block may be used. Seedbed preparation, seeding, fertilizing, and mulching shall comply with standards in local technical guides. The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals.

Operation and maintenance

A maintenance program shall be established to maintain diversion capacity, storage, ridge height, and the outlets. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practices installed with SCS assistance. Diversion ridges can be hazardous for farming operations or mowing. Any hazards must be brought to the attention of the responsible person.

Plans and specifications

Plans and specifications for installing diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

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Section IV
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DIVERSION (Feet)

Conditions Where Practice Applies

Diversions shall not be substituted for terraces on land requiring terracing for erosion control.

Where it is necessary to reduce the length of slope in conjunction with contour farming or strip cropping, the spacing of diversions should be such that the soil loss does not exceed the allowable as determined from the Soil Loss Prediction Equation. When diversion channels are not vegetated, the land should be cultivated parallel to the diversion.

Soil Texture	Permissible Velocity (Ft./Sec.)					
	Bare Channel	Channel Vegetation				
		Retardance	Poor	Fair	Good	
Sand, silt,		B		3.0	4.0	
Sandy loam and	1.5	C	1.5	2.5	3.5	
Silty loam		D		2.0	3.0	
Silty clay loam		B		4.0	5.0	
Sandy clay loam	2.0	C	2.5	3.5	4.5	
		D		3.0	4.0	
Clay	2.5	B		5.0	6.0	
		C	3.0	4.5	5.5	
		D		4.0	5.0	
Rock or Protec- tive Linings	5.0					

All diversions on grades averaging more than 0.6 percent (except for the upper 200') shall have adequate vegetation established.

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DIVERSION SPECIFICATIONS

All ditches or gullies shall be filled, and trees and other obstructions shall be removed before construction begins or shall be part of the construction.

The diversion shall be constructed to a planned alignment, grade, and cross section.

If underground conduits are located under diversion ridges, mechanical compaction, water packing, and installation and backfill of conduit trenches shall be made in advance to allow adequate settlement. The materials used for the inlet and conduit shall be suitable for the purpose intended and shall meet the requirements of subsurface drains (606). Diversion ridges constructed across gullies or depressions shall be compacted by machinery travel or other means sufficient to insure proper functioning of the diversions. The surface of the finished diversion shall be reasonably smooth and present a workmanlike appearance.

If necessary, topsoil shall be stockpiled and spread over excavations and other areas to facilitate revegetation. Seedbed preparation, seeding, fertilizing, and mulching shall comply with recommendations in local technical guides.

A maintenance program should be established to maintain diversion capacity, storage, ridge height, and the outlets. Diversion ridges can be hazardous for farming operations or mowing. Any hazards must be brought to the attention of the responsible person.

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DIVERSION ENGINEERING NOTEKEEPING

Design and Layout Survey

A. Record the following information:

1. Location sketch
2. Drainage area
3. Design flow
4. Channel grade
5. Velocity
6. Channel and ridge dimensions
7. Calculation of volume of earth to be moved if payment is by volume
8. Planned length of each diversion
9. Location of an adequate outlet
10. Specifications for seeding as applicable
11. Date and signature of designer and person approving design

Construction Check

A. Make and record the following construction check items:

1. Profile of the completed channel and ridge
2. Cross-section of channel and ridge for each design section
3. Length of each completed diversion

B. Record the condition or adequacy of vegetation if required.

C. Compute earthwork quantities, where applicable, if different from planned quantities.

D. Record statement concerning adequacy of outlet.

E. Record date and sign statement concerning adequacy of construction.

Recording Data

A. Data will be recorded in a standard engineering field book, or on form NC-ENG-22, "Diversion Data Sheet."